



**Intel[®] Server Board S5000PAL
Intel[®] Server Board S5000XAL**

**Intel[®] Server Systems SR1550AL /
SR2500AL – Intel RAID Cache**

Tested Memory Report

Revision 8.0
October 2006

Revision History

Date	Rev	Modifications
Jun/2006	1.0	Release version.
Jun/2006	2.0	Removed Micron* 512MB part. Added Micron 1GB and 4GB part. Added Samsung* 512MB part. Added Hynix* 512MB and 1GB parts. Added Smart* 128MB and Micron 256MB mini-DIMM parts. (In shaded areas)
Jun/2006	3.0	Added Kingston* 512MB part. Added ATP Electronics* 1GB parts. (In shaded areas)
Jul/2006	4.0	Added A-Data Technology*, Apacer*, Crucial Technology*, Hynix, Dataram*, Kingston, and Smart 512MB parts. Added Apacer, ATP Electronics, Crucial Technology, Kingston, Smart, Micron, Hynix, and Samsung 1GB parts. Added Qimonda (Infineon)* and ATP Electronics 2GB parts. (In shaded areas)
Aug/2006	5.0	Added A-Data Technology, Apacer, ATP Electronics, and Dataram 512MB parts. Added Apacer, Kingston, and Smart 1GB parts. Added Mini-DIMMs. (In shaded areas)
Aug/2006	6.0	Added Smart 512MB parts. Added Smart, ATP Electronics, and Dataram 1GB parts. Added Apacer 2GB part. (In shaded area)
Aug/2006	7.0	Added Samsung* and Qimonda 512MB parts. Added Samsung, Nanya*, Qimonda, and Kingston 1GB parts. (In shaded area)
Oct/2006	8.0	Updated vendor sales information and memory details. Added Micron, ATP Electronics, Kingston, Nanya, Legacy, and Smart 512MB parts. Added Kingston, Smart, and ATP Electronics 1GB parts. Added Samsung, Nanya, Apacer, ATP Electronics, and Smart 2GB parts. (In shaded area)

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The Intel® Server Board S5000PAL may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

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Please Note: DIMM devices with gold contacts should NOT be placed into DIMM sockets with tin-lead contacts or vice-versa. Mixing dissimilar metal contact types has been shown to result in unreliable memory operation. Intel recommends similar manufacturer and similar speeds in each Rank on the memory module. Mixing of dissimilar memory is NOT recommended.

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1. Overview of Memory Testing

The following test processes are used to qualify Dual In-Line Memory Modules (DIMMs) for use with the Intel® Server Board S5000PAL. Memory is a vital subsystem in a server. Intel requires that strict guidelines be met before a DIMM vendor is added to the Tested Memory Report. To be included on the list as a fully supported DIMM, the memory must undergo rigorous tests to ensure that the product will perform the intended server product functions. Memory qualification for Intel server, workstation and RAID controller products is performed both by Intel's Memory Validation Lab (MVL) and by an independent external test lab, Computer Memory Test Lab* (CMTL).

The Tested Memory Lists for Intel's server board, workstation board, and RAID controller products categorize memory modules as Advanced Tested. The Advanced Testing process includes a standard paper qualification and then is followed by two levels of functional testing. DIMMs that have completed and passed Advanced Testing are considered to be compatible with the product on which they were tested, and with the test software and operating systems that was used during the test process.

Note: Memory qualification for main memory is done by testing identical memory modules in all DIMM slots. Memory qualification does not include testing of mixed DIMM type and/or vendors. Mixing of DIMM type and/or vendors is not recommended.

1.1 Paper Qualification

A paper qualification is performed to verify that the specifications of a given DIMM meet Intel's memory specifications for a given product. Specification criteria reviewed include: critical timings, electrical characteristics, timing requirements, environmental requirements, and packaging requirements.

1.2 Functional Testing

After a given DIMM passes the standard paper qualification, functionality of the DIMM is then tested with the intended Intel product. Two levels of functional testing is performed; Standard and Advanced.

Standard functional testing requires that the given DIMM and Intel product combination operate with no failures for a period of no less than 24 hours for both minimum and maximum DIMM configurations. Testing is performed using a Microsoft Windows* operating system and a custom test package. The test systems operate with standard voltage and at room temperature.

1.3 Advanced functional testing

Advanced functional testing requires that the given DIMM and Intel product combination operate with no failures for a period of no less than 24 hours for both minimum and maximum DIMM configurations. Testing is performed with multiple operating systems and various custom test packages. Each test configuration is tested with various voltage and temperature margin conditions.

1.4 Computer Memory Test Lab*

Computer Memory Test Lab, also known as “CMTL*” is a leading memory test organization responsible for testing a broad range of memory products. A memory product, which receives a “PASS” after being tested by CMTL, means it functions correctly and consumers can use the product to perform the intended server functions. In order to pass these stringent standards, memory products must maintain the highest manufacturing procedures and pass an exacting battery of tests. Testing is performed with Intel supplied equipment and procedures defined by Intel’s various functional testing levels.

CMTL* Contact Information:

Office: (949) 716-8690
Main Fax: (949) 716-8691

Computer Memory Test Lab (CMTL)
24 Hammond Suite F
Irvine, CA 92618
<http://www.cmtlabs.com/>

2. Memory Requirements – Server Board and SAS RAID

2.1 Server Board Memory Sub-system

The Intel® Server Board S5000PAL and Intel® Server Board S5000XAL have memory sub-systems designed to support only Fully Buffered Dual In-line (FBD) Registered DDR2-533 and DDR2-667 FBDIMM memory ECC Synchronous Dynamic Random Access Memory (SDRAM). Other industry naming conventions for DDR2-533 include PC2-4200 and DDR2-667 include PC2-5300.

Note: Only DDR2 DIMMs that are Fully Buffered is supported on these server boards.

These server boards provide eight DIMMs slots. They are capable of supporting a minimum of 512MBs using a single 512MB FBDIMM, and a maximum of upto 32GBs. Supported FBDIMM capacities for main memory include: 512MB, 1GB, 2GB, and 4GB.

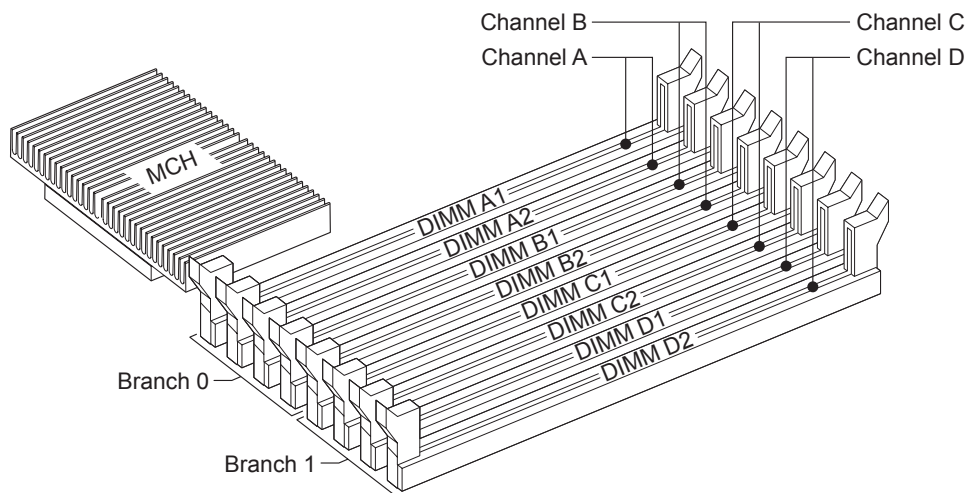
Maximum 8 DIMM System Memory Configuration – x8 Single Rank

DRAM Technology x8 Single Rank	Maximum Capacity Mirrored Mode	Maximum Capacity Non-Mirrored Mode
512 Mb	2 GB	4 GB
1024 Mb	4 GB	8 GB
2048 Mb	8 GB	16 GB

Maximum 8 DIMM System Memory Configuration – x4 Dual Rank

DRAM Technology x4 Dual Rank	Maximum Capacity Mirrored Mode	Maximum Capacity Non-Mirrored Mode
512 Mb	8 GB	16 GB
1024 Mb	16 GB	32 GB
2048 Mb	16 GB	32 GB

The MCH masters four fully buffered DIMM (FBD) memory channels. FBD memory utilizes a narrow high speed frame oriented interface referred to as a channel. The four FBD channels are organized into two branches of two channels each, Branch 0 consists of channels A and B, and Branch 1 consists of channels C and D. Each branch is supported by a separate memory controller. The two channels on each branch operate in lock step to increase FBD bandwidth. On the server board, the four channels are routed to eight DIMM slots and are capable of supporting registered DDR2-533 and DDR2-667 FBDIMM memory (stacked or unstacked). Peak theoretical memory data bandwidth is 6.4GB/s with DDR2-533 and 8.0GB/s with DDR2-667.



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Figure 1. Memory Layout

2.1.1 DIMM Population Rules

DIMM population rules depend on the operating mode of the memory controller, which is determined by the number of DIMMs installed. DIMMs must be populated in pairs. DIMM pairs are populated in the following DIMM slot order: A1 & B1, C1 & D1, A2 & B2, C2 & D2. DIMMs within a given pair must be identical with respect to size, speed, and organization. However, DIMM capacities can be different between different DIMM pairs.

For example, a valid mixed DIMM configuration may have 512MB DIMMs installed in DIMM Slots A1 & B1, and 1GB DIMMs installed in DIMM slots C1 & D1.

Notes:

- Single channel mode is only tested and supported with a 512MB x8 FBDIMM installed in DIMM Slot A1.
- The supported memory configurations must meet population rules defined above.
- **For best performance, the number of DIMMs installed should be balanced across both memory branches. For Example: a four DIMM configuration will perform better than a two DIMM configuration and should be installed in DIMM Slots A1, B1, C1, and D1. An eight DIMM configuration will perform better than a six DIMM configuration.**
- Although mixed DIMM capacities between channels is supported, Intel does not validate DIMMs in mixed DIMM configurations.

See the Intel® Server Board S5000PAL / S5000XAL Technical Product Specification for more information about DIMM population rules as they pertain to Memory Mirroring and DIMM Sparing configurations.

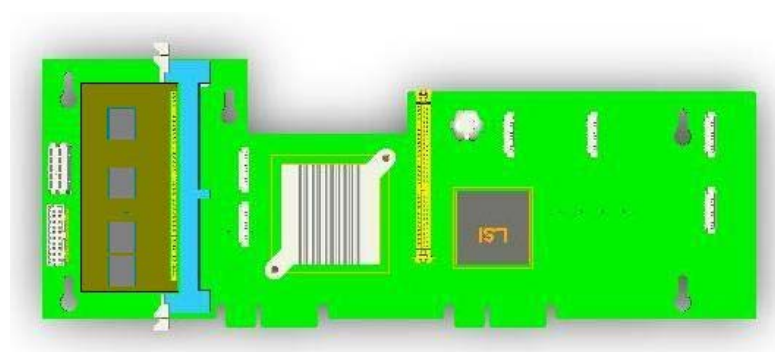
The server board supports up to eight DDR2-533 or DDR2-667 Fully Buffered DIMMs (FBD memory). The following tables show the maximum memory configurations supported using the specified memory technology.

The following table lists the current supported memory types:

FBDIMM-533 CL4 & FBDIMM-667 CL5 Memory Matrix						
DIMM Capacity	DIMM Organization	SDRAM Density	SDRAM Organization	# SDRAM Devices	# Address bits Row/Bank/Column	# of Ranks
512MB	64M x72	512Mbit	64M x 8	9	14/10/2	1
1GB	128M x 72	512Mbit	64M x 8	18	14/10/2	2
1GB	128M x 72	512Mbit	128M x 4	18	14/11/2	1
1GB	128M x 72	512Mbit	128M x 8	9	14/10/3	1
2GB	256M x72	512Mbit	128M x 4	36	14/11/2	2
2GB	256M x72	1Gbit	256M x 4	18	14/11/3	1
2GB	256M x72	1Gbit	128M x 8	18	14/10/3	2
4GB	512M x72	1Gbit	256M x 4	36	14/11/3	2
4GB	512M x 72	2Gbit	512M x 4	18	13/11/2	2

2.2 Intel® Server System SR1550AL / Intel® Server System SR2500AL with Active SAS Mid-plane

The Active SAS/SAS RAID Mid-Plane board is an optional feature of the Intel Server Systems SR1550AL and SR2500AL. By default, this mid-plane option provides software RAID levels 0,1,and 10 utilizing Intel® Embedded RAID Technology II. The active mid-plane supports options to provide full hardware RAID support. Options required to enable hardware RAID support include an Intel® RAID Activation Key (Product order code - AXXRAK18E) and installation of a Mini-DIMM for Intel RAID Cache support. To protect from data loss during an unexpected power loss event, an Intel® RAID Smart Battery Backup module (AXXRSBBU3) is also supported. Hardware RAID levels supported include 0, 1, 5, 10, and 50.



2.2.1 Intel RAID Cache Support

To enable support for hardware RAID, the active mid-plane provides a 244-pin mini-DIMM connector (J8C1), supporting a single registered ECC non-parity DDR2-400 MHz Mini-DIMM to provide Intel RAID cache. Mini-DIMM capacities supported range from 128MB to 1GB. However, if the optional battery backup unit is used, battery retention requirements can only support single rank DIMMs, which will limit the number of devices consuming power during self-refresh mode. This limits the supported memory list to only 128MB, 256MB and 512MB modules.

- DDRII – 400MHz SDRAM only.
- The SAS Mid-plane RAID board will only support DIMMs with 2 banks address select.
- Registered DIMMs only (board not routed nor simulated for unbuffered DIMMs)
- 72-bit ECC DIMMs only. 64-bit data bus width + 8-bit ECC

3. Intel® Server Board S5000PAL / S5000XAL Tested Memory

The following tables list DIMM devices tested to be compatible with the Intel® Server Board S5000PAL and Intel® Server Board S5000XAL. The list of tested memory is periodically updated, as qualified memory is added during the production life of the Intel product.

Intel strongly recommends the use of ECC memory in all server products.

Memory modules not listed in the following tables have not been tested for compatibility and their use with the specified server boards may result in unpredictable operation and data loss.

Caution: Third party memory vendors may use the same module part number with different DRAM vendors and die revisions. To insure proper system operation, verify that each DRAM vendor and die revision has been separately tested and qualified. Please notify CMTL if there is a discrepancy. This list is subject to change without notice.

Note: This list is not intended to be all-inclusive. It is provided as a convenience to Intel's general customer base, but Intel does not make any representations or warranties whatsoever regarding the quality, reliability, functionality, or compatibility of these memory modules.

3.1 Intel® Server System SR1550AL / Intel® Server System SR2500AL SAS Mid-plane RAID Board Memory Population

The SAS Mid-Plane RAID board is an optional feature of the Intel Server Systems SR1550AL and SR2500AL which allows for the integration of RAID functionality using the LSISAS1068 controller along with the IOP80333 IO processor and a single DDR2 memory module.

The SAS Mid-Plane memory subsystem consists of a single 244-pin Registered DDR2 SDRAM DIMM socket connected to the IOP80333 IOP DDR interface. Data is clocked at both the rising and falling edges of the 200MHz bus clock to achieve an effective source synchronous frequency of 400MHz.

- DDRII – 400MHz SDRAM only.
- The SAS Mid-plane RAID board will only support DIMMs with 2 banks address select.
- Registered DIMMs only (board not routed nor simulated for unbuffered DIMMs)
- 72-bit ECC DIMMs only. 64-bit data bus width + 8-bit ECC

Note: Due to battery retention requirements for the optional battery backup solution, the SAS mid-plane RAID will only support single rank DIMMs to limit the number of devices consuming power during self-refresh mode. This limits the qualification list to only 128MB, 256MB and 512MB modules.

4. Intel® Server Board S5000PAL / S5000XAL Main Memory Tested

The following tables list DIMM devices tested to be compatible with the Intel® Server Board S5000PAL / S5000XAL. The list of tested memory is periodically updated as qualified memory is added during the production life of the Intel product.

Intel strongly recommends the use of ECC memory in all server products.

Memory modules not listed in the following tables have not been tested for compatibility and their use with the Intel® Server Board S5000PAL / S5000XAL may result in unpredictable operation and data loss.

Caution: Third party memory vendors may use the same module part number with different DRAM vendors and die revisions. To insure proper system operation, verify that each DRAM vendor and die revision has been separately tested and qualified. Please notify CMTL if there is a discrepancy. This list is subject to change without notice.

Note: This list is not intended to be all-inclusive. It is provided as a convenience to Intel's general customer base, but Intel does not make any representations or warranties whatsoever regarding the quality, reliability, functionality, or compatibility of these memory modules.

Intel® Server Board S5000PAL / S5000XAL
Fully Buffered ECC, DDR2-533 DIMM Modules
512 MB Sizes (64Mx72)

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	AMB Vendor	AMB Revision	Heat-sink Vendor	DRAM Organization	Rank	Date
Samsung	M395T6553CZ-4-CD51	K4T51083QC-ZCD5	Samsung		IDT	AMB048 0A5RJ A1.5		(64Mx8)*9	1	6/1/06
Hynix	HYMP564F72BP8D2-C4	HY5PS12821BFP-C4	Hynix		IDT	AMB048 0A5RJA 1.5		(64Mx8)*9	1	6/15/06
Kingston	KVR533D2S8F4/512I	HYB18T512800AF-3.7-A	Qimonda		Intel QG6400	GB C0		(64Mx8)*9	1	6/13/2006
A-Data Technology	M2OEL2G3HAC5211B5Z	EDE5108AGSE-5C-E rev G	Elpida	B62FRCA na				(64Mx8)*9	1	6/26/06
Apacer	78.97G96.404	K4T51083QC-ZCD5 rev C	Samsung	48.16203. 014 rev 4				(64Mx8)*9	1	6/23/06
Crucial Technology	CT9HTF6472FY53EB4E3.01	MT47H64M8CB-37E rev B	Micron	0499 rev B				(64Mx8)*9	1	6/28/06
Dataram	DTM65505B	EDE5108AGSE-5C-E rev G	Elpida	40053A rev B				(64Mx8)*9	1	7/5/06
Smart Modular Technologies	SG647FBD64843-IAI	HYB18T512800AF37 rev A	Qimonda (Infineon)	240-21-4 na				(64Mx8)*9	1	7/10/06
ATP Electronics	AP64K72A8BHD5S	K4T51083QC-ZCD5 rev C	Samsung	SP240A0 8K1 na				(64Mx8)*9	1	7/17/06
Smart Modular Technologies	SG647FBD64843-IAI	HYB18T512800AF37 rev A	Qimonda (Infineon)	240-21-4 na				(64Mx8)*9	1	8/8/06
Legacy Electronics Inc.	B557K4C90AE-37R	K4T51083QC-ZCD5 rev C	Samsung	D2F18A na				(64Mx8)*9	1	8/18/06
Kingston	KVR533D2S8F4/512I	E5108AGBG-5C-E rev G	Elpida	2025285- 002.A00 na				(64Mx8)*9	1	8/21/06
Smart Modular Technologies	TD647FBD64843SCI	K4T51083QC-ZCD5 rev C	Samsung	PG54G24 0NFBUB3 RA rev A				(64Mx8)*9	1	9/7/06
Smart Modular Technologies	TD647FBD64843IAI	HYB18T512800AF37 rev A	Qimonda (Infineon)	PG54G24 0NFBUB3 RA rev A				(64Mx8)*9	1	9/7/06

(+) This vendor is part of the CMTL Certification program. This means this part has/will be tested across all compatible Intel Server Boards. For further information contact CMTL @ <http://cmtlabs.com/>

Note: Some memory modules may have thermal issues when used in a non-Intel 1U rack solution. It is advised that you verify any thermal limitations with your chassis supplier before purchasing a chassis.

Note: The use of x4 FBDIMMs will only be supported with the server system operating in "Performance" mode (default). The use of x4 FBDIMMs while the server system is configured to operate in "Acoustics" mode is not supported.

**Fully Buffered ECC, DDR2-667 DIMM Modules
512 MB Sizes (64Mx72)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	AMB Vendor	AMB Revision	Heat-sink Vendor	DRAM Organization	Rank	Date
Hynix	HYMP564F72-BP8N2-Y5	HY5PS12821BFP-Y5	Hynix		Intel	GB C0		(64Mx8)*9	1	7/13/06
A-Data Technology	M2OEL5G3HAC7111C5Z	EDE5108AGSE-6E-E rev G	Elpida	B62FRCA na				(64Mx8)*9	1	7/17/06
Apacer	78.97G99.404	K4T51083QC-ZCE6 rev C	Samsung	48.16203.014 rev 4				(64Mx8)*9	1	7/18/06
Dataram	DTM65506A	NT5TU64M8AE-3C rev A	Nanya	40053A rev B				(64Mx8)*9	1	7/21/06
Smart Modular Technologies	SG647FBD648521AD5	HYB18T512800AF3S rev A	Qimonda (Infineon)	PG54G240NFBUB3RA rev A				(64Mx8)*9	1	7/27/06
Qimonda (Infineon)	HYS72T64400HFN-3S-A	HYB18T512800AF-3S	Qimonda (Infineon)		Intel	GB C0		(64Mx8)*9	1	8/2/06
Samsung	M395T6553CZ4-CE61	K4T51083QC-ZCE6	Samsung		IDT	1.5		(64Mx8)*9	1	8/2/06
Samsung	M395T6553CZ4-CE60	K4T51083QC-ZCE6	Samsung		Intel	GB C0		(64Mx8)*9	1	8/15/06
Micron	MT9HTF6472FY-667B4E3	MT47H64M8CB-3	Micron		Intel			(64Mx8)*9	1	9/13/06
ATP Electronics	AP64K72A8BHE6S	K4T51083QC-ZCE6 rev C	Samsung	SP240A08K1 na				(64Mx8)*9	1	8/16/06
ATP Electronics	AP64K72A8BHE6S	K4T51083QC-ZCE6 rev C	Samsung	SP240A08K1 na				(64Mx8)*9	1	8/30/06
Kingston	KVR667D2S8F5/512I	E5108AGBG-6E-E rev G	Elpida	2025285-002.A00 na				(64Mx8)*9	1	9/13/06
Nanya Technology Corporation	NT512T72U89A5BD-3C	NT5TU64M8AE-3C rev A	Nanya	NTPCB00056P na				(64Mx8)*9	1	9/20/06

(+) This vendor is part of the CMTL Certification program. This means this part has/will be tested across all compatible Intel Server Boards. For further information contact CMTL @ <http://cmtlabs.com/>

Note: Some memory modules may have thermal issues when used in a non-Intel 1U rack solution. It is advised that you verify any thermal limitations with your chassis supplier before purchasing a chassis.

Note: The use of x4 FBDIMMs will only be supported with the server system operating in "Performance" mode (default). The use of x4 FBDIMMs while the server system is configured to operate in "Acoustics" mode is not supported.

Intel® Server Board S5000PAL / S5000XAL
Fully Buffered ECC, DDR2-533 DIMM Modules
1 GB Sizes (128Mx72)

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	AMB Vendor	AMB Revision	Heat-sink Vendor	DRAM Organization	Rank	Date
Samsung*	M395T2953CZ4-CD51	K4T51083QC-ZCD5	Samsung		IDT	AMB048 0A5RJ A1.5		(64Mx8)*18	2	5/18/06
Hynix*	HYMP512F72BP8D2-C4	HY5PS12821BFP-C4	Hynix		IDT	AMB048 0A5RJ A1.5		(64Mx8)*18	2	6/1/06
Micron	MT18HTF12872FDY-53EB5E3	MT47H64M8CB-37E	Micron		Intel	QG6400 C0		(64Mx8)*18	2	6/1/06
Hynix	HYMP512F72BP8N2-C4	HY5PS12821BFP-C4	Hynix		Intel	QG6400 C0		(64Mx8)*18	2	6/15/06
ATP Electronics	K4T51083QC-ZCD5 rev C	AP28K72S8BH D5S	Samsung		IDT 0480A5R J	Y0604D	Foxconn	(64Mx8)*18	2	6/22/20 06
Apacer	78.07G96.405	K4T51083QC-ZCD5 rev C	Samsung	48.16203. 015 rev 5				(64Mx8)*18	2	6/23/06
ATP Electronics	AP28K72S8BHD5S	K4T51083QC-ZCD5 rev C	Samsung	SP240S0 8K1 na				(64Mx8)*18	2	6/15/06
Crucial Technology	CT18HTF12872FDY53EB5E3.01	MT47H64M8CB-37E rev B	Micron	500 rev C				(64Mx8)*18	2	6/30/06
Kingston	KVR533D2D8F4/1GI	HYB18T512800AF-3.7-A	Qimonda		IDT	AMB048 0A5RJ A1.5		(64Mx8)*18	2	6/13/06
Smart Modular Technologies	SG1287FBD64843NAI	NT5TU64M8AE-3C rev A	Nanya	PG58G24 0NFBUB3 RB rev C				(64Mx8)*18	2	7/10/06
Smart Modular Technologies	TD1287FBD64843SCI	K4T51083QC-ZCD5 rev C	Samsung	PG58G24 0NFBUB3 RBS rev B						7/12/06
Smart Modular Technologies	SG1287FBD64843-IAI	HYB18T512800AF37 rev A	Qimonda (Infineon)	240-22-5 na				(64Mx8)*18	2	8/8/06
Kingston	KVR533D2D8F4/1GI	HYB18T512800AF-3.7-A	Qimonda (Infineon)		Intel	QG6400 C0		(64Mx8)*18	2	8/2/06
Kingston	KVR533D2D8F4/1GI	E5108AGBG-5C-E rev G	Elpida	2025286- 002.A00 na				(64Mx8)*18	2	8/18/06

(+) This vendor is part of the CMTL Certification program. This means this part has/will be tested across all compatible Intel Server Boards. For further information contact CMTL @ <http://cmtlabs.com/>

Note: Some memory modules may have thermal issues when used in a non-Intel 1U rack solution. It is advised that you verify any thermal limitations with your chassis supplier before purchasing a chassis.

Note: The use of x4 FBDIMMs will only be supported with the server system operating in "Performance" mode (default). The use of x4 FBDIMMs while the server system is configured to operate in "Acoustics" mode is not supported.

**Fully Buffered ECC, DDR2-677 DIMM Modules
1 GB Sizes (128Mx72)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	AMB Vendor	AMB Revision	Heat-sink Vendor	DRAM Organization	Rank	Date
Samsung	M395T2953CZ4-CE60	K4T51083QC-ZCE6	Samsung		Intel	QG6402 C0		(64Mx8)*18	2	7/13/06
Hynix	HYMP512F72BP8N2-Y5	HY5PS12821BFP-Y5	Hynix		Intel	QG6402 C0		(64Mx8)*18	2	7/13/06
Apacer	78.07G99.405	K4T51083QC-ZCE6 rev C	Samsung	48.16203.015 rev 5						7/20/06
ATP Electronics	AP28K72S8BHE6S	K4T51083QC-ZCE6 rev C	Samsung	SP240S08K1 na				(64Mx8)*18	2	7/28/06
Smart Modular Technologies	SG1287FBD64852IAD5	HYB18T512800AF3S rev A	Qimonda (Infineon)	PG58G240NFBUB3RBS rev B				(64Mx8)*18	2	7/28/06
Dataram	DTM65507A	NT5TU64M8AE-3C rev A	Nanya	40053A rev B				(64Mx8)*18	2	8/7/06
Smart Modular Technologies	SG1287FBD64852SCD5	K4T51083QC-ZCE6 rev C	Samsung	PG58G240NFBUB3RBS rev B				(64Mx8)*18	2	8/7/06
Qimonda (Infineon)	HYS72T128420HFN-3S-A	HYB18T512800AF-3S	Qimonda (Infineon)		Intel	QG6402 C0		(64Mx8)*18	2	8/14/06
Nanya	NT1GT72U8PA5BD-3C	NT5U64M8AE-3C	Nanya		IDT	AMB0480A5RJ A1.5		(64Mx8)*18	2	8/14/06
Samsung	M395T2953CZ4-CE61	K4T51083QC-ZCE6	Samsung		IDT	AMB0480A5RJ A1.5		(64Mx8)*18	2	8/15/06
Smart Modular Technologies	SG1287FBD64852NAD5	NT5TU64M8AE-3C rev A	Nanya	PG58G240NFBUB3RBS rev B				(64Mx8)*18	2	8/12/06
Smart Modular Technologies	SG1287FBD64852-IAI	HYB18T512800AF3S rev A	Qimonda (Infineon)	K0545 na				(64Mx8)*18	2	8/14/06
Kingston	KVR667D2D8F5/1GI	E5108AG-6E-E rev G	Elpida	2025286-001.F00 na				(64Mx8)*18	2	8/24/06
ATP Electronics	AP28K72S8BHE6S	K4T51083QC-ZCE6 rev C	Samsung	SP240S08K1 na				(64Mx8)*18	2	8/29/06
Kingston	KVR667D2D8F5/1GI	E5108AGBG-6E-E rev G	Elpida	2025286-002.A00 na				(64Mx8)*18	2	9/17/06

(+) This vendor is part of the CMTL Certification program. This means this part has/will be tested across all compatible Intel Server Boards. For further information contact CMTL @ <http://cmtlabs.com/>

Note: Some memory modules may have thermal issues when used in a non-Intel 1U rack solution. It is advised that you verify any thermal limitations with your chassis supplier before purchasing a chassis.

Note: The use of x4 FBDIMMs will only be supported with the server system operating in "Performance" mode (default). The use of x4 FBDIMMs while the server system is configured to operate in "Acoustics" mode is not supported.

Intel® Server Board S5000PAL / S5000XAL**Fully Buffered ECC, DDR2-533 DIMM Modules****2 GB Sizes (256Mx72)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	AMB Vendor	AMB Revision	Heat-sink Vendor	DRAM Organization	Rank	Date
Kingston	KVR533D2D4F4/2GI	HYB18T512400AF-3.7	Qimonda (Infineon)		Intel	QG6400C0			2	5/18/06
Samsung	M395T5750CZ4-CD51	K4T51043QC-ZCD5	Samsung		IDT	AMB0480A5RJ A1.5			2	6/1/06
ATP Electronics	K4T51043QC-ZCD5 rev C	AP56K72G4BHD5S	Samsung		IDT 0480A5RJ	Y0607D	Foxconn	256M x 72	x 4	6/22/2006
ATP Electronics	AP56K72G4BHD5S	K4T51043QC-ZCD5 rev C	Samsung	SP240G04K1 na	Intel			(128Mx4)*36	x4	6/20/06
Apacer	78.A7G9G.401	K4T51043QC-ZCD5 rev C	Samsung	48.1A205.011 rev 1				(128Mx4)*36	x4	8/10/06
Smart Modular Technologies	SG2567FBD28443IAI	HYB18T512400AF37 rev A	Qimonda (Infineon)	PG54G240NFSUB1RES rev B				(128Mx4)*36	x4	8/15/06
Smart Modular Technologies	TD2567FBD28443IAI	HYB18T512400AF37 rev A	Qimonda (Infineon)	PG54G240NFSUB1RES rev B				(128Mx4)*36	x4	8/15/06
Smart Modular Technologies	SG2567FBD28443IAD5	HYB18T512400AF37 rev A	Qimonda (Infineon)	PG54G240NFSUB1RES rev B				(128Mx4)*36	x4	9/14/06
Smart Modular Technologies	SG2567FBD28443SCD5	K4T51043QC-ZCD5 rev C	Samsung	PG54G240NFSUB1RES rev B				(128Mx4)*36	x4	9/15/06

**Fully Buffered ECC, DDR2-667 DIMM Modules
2 GB Sizes (256Mx72)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	AMB Vendor	AMB Revision	Heat-sink Vendor	DRAM Organization	Rank	Date
Qimonda (Infineon)	HYS72T256420HFN-3S-A	HYB18T512400AF-3S	Qimonda (Infineon)		Intel	QG6402C0		(128Mx4)*36	2	7/13/06
Apacer	78.A7G9H.401	K4T51043QC-ZCE6 rev C	Samsung					(128Mx4)*36	2	8/1/06
Samsung	M395T5750CZ4-CE61	K4T51043QC	Samsung		IDT			(128Mx4)*36	2	9/28/06
ATP Electronics	AP56K72G4BHE6S	K4T51043QC-ZCE6 rev C	Samsung	SP240G04K1 na				(128Mx4)*36	2	8/12/06
Smart Modular Technologies	SG2567FBD28452IAD5	HYB18T512400AF3S rev A	Qimonda (Infineon)	PG54G240NFSUB1RES rev B				(128Mx4)*36	2	8/14/06
ATP Electronics	AP56K72G4BHE6S	K4T51043QC-ZCE6 rev C	Samsung	SP240G04K1 na				(128Mx4)*36	2	8/24/06
Smart Modular Technologies	SG2567FBD28452IBD5	HYB18T512400BF-3S rev B	Qimonda (Infineon)	PG54G240NFSUB1RES rev B				(128Mx4)*36	2	9/19/06
Nanya Technology Corporation	NT2GT72U4NA1BD-3C	NT5TU128M4AE-3C rev A	Nanya	NTPCB00057P na				(128Mx4)*36	2	9/20/06

(+) This vendor is part of the CMTL Certification program. This means this part has/will be tested across all compatible Intel Server Boards. For further information contact CMTL @ <http://cmtlabs.com/>

Note: Some memory modules may have thermal issues when used in a non-Intel 1U rack solution. It is advised that you verify any thermal limitations with your chassis supplier before purchasing a chassis.

Note: The use of x4 FBDIMMs will only be supported with the server system operating in "Performance" mode (default). The use of x4 FBDIMMs while the server system is configured to operate in "Acoustics" mode is not supported.

Intel® Server Board S5000PAL / S5000XAL**Fully Buffered ECC, DDR2-533 DIMM Modules****4 GB Sizes (512Mx72)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	AMB Vendor	AMB Revision	Heat-sink Vendor	DRAM Organization	Rank	Date
Micron	MT36HTS51272 FY-53EA2D3	MT47H512M4 THJ-3E	Micron		IDT 1.5	AMB048 0A5RJ A1.5				6/15/06

Fully Buffered ECC, DDR2-667 DIMM Modules**4 GB Sizes (512Mx72)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	AMB Vendor	AMB Revision	Heat-sink Vendor	DRAM Organization	Rank	Date

(+) This vendor is part of the CMTL Certification program. This means this part has/will be tested across all compatible Intel Server Boards. For further information contact CMTL @ <http://cmtlabs.com/>

Note: Some memory modules may have thermal issues when used in a non-Intel 1U rack solution. It is advised that you verify any thermal limitations with your chassis supplier before purchasing a chassis.

Note: The use of x4 FBDIMMs will only be supported with the server system operating in "Performance" mode (default). The use of x4 FBDIMMs while the server system is configured to operate in "Acoustics" mode is not supported.

5. Intel® Server Systems SR1550AL / SR2500AL - Intel RAID Cache Tested Memory

The following tables list DIMM devices tested to be compatible with the Intel® Server Systems SR1550AL / SR2500AL SAS Mid-plane RAID boards. The list of tested memory is periodically updated as qualified memory is added during the production life of the Intel product.

Intel strongly recommends the use of ECC memory in all server products.

Memory modules not listed in the following tables have not been tested for compatibility and their use with the Intel® SAS Mid-plane RAID board sub-system with the Intel® Server Board S5000PAL / S5000XAL may result in unpredictable operation and data loss.

The Intel® SAS Mid-Plane RAID DIMM should be a single rank device (with at maximum nine x8 devices) due to the Intel® RAID Smart Battery (RSB) retention time requirements.

Caution: Third party memory vendors may use the same module part number with different DRAM vendors and die revisions. To insure proper system operation, verify that each DRAM vendor and die revision has been separately tested and qualified. Please notify CMTL if there is a discrepancy. This list is subject to change without notice.

Note: This list is not intended to be all-inclusive. It is provided as a convenience to Intel's general customer base, but Intel does not make any representations or warranties whatsoever regarding the quality, reliability, functionality, or compatibility of these memory modules.

Active SAS / SAS RAID Mid-plane RAID Board**Registered ECC DDR Mini-DIMM Modules****128 MB Sizes (16Mx16)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	Date	Lead Free	DRAM Organization	Speed	EOL
Smart*	SG572163FG8RWDG						16Mx16 (256Mb)	DDR2-400	
Micron*	MT5HTF1672KY-40EB2						16Mx16 (256Mb)	DDR2-400	

Active SAS / SAS RAID Mid-plane RAID Board**Registered ECC DDR Mini-DIMM Modules****256 MB Sizes (32Mx8)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	Date	Lead Free	DRAM Organization	Speed	EOL
Micron	MT5HTF3272KY-40EB1		Micron					DDR2-400	
Smart	SG572328FG8RWDB							DDR2-400	
Micron	MT5HTF3272KY-40ED3		Micron					DDR2-400	
Micron	MT5HTF3272KY-40EB2						32Mx16 (512Mb)	DDR2-400	

Active SAS / SAS RAID Mid-plane RAID Board**Registered ECC DDR Mini-DIMM Modules****512 MB Sizes (64Mx8)**

Manufacturer	Part Number	DRAM Part Number	DRAM Vendor	PCB Part Number	Date	Lead Free	DRAM Organization	Speed	EOL
Micron	MT9HTF6472PKY-40EB1		Micron					DDR2-400	
Smart	SG572648FG8RZDB							DDR2-400	
Micron	MT9HVF6472PKY-40EB2						64Mx8 (512Mb)	DDR2-400	

(+) This vendor is part of the CMTL Certification program. This means this part has/will be tested across all compatible Intel Server Boards. For further information contact CMTL @ <http://cmtlabs.com/>

Sales Information

Vendor Name	Web URL	Vendor Direct Sales Info
ATP Electronics	http://www.atpinc.com/	Albert Chung Tel: (1) 408-732-5831, Ext 5858 Fax: (1) 408-732-5055 sales@atpinc.com
ATP Electronics -- Taiwan Inc.	http://www.atpinc.com/	Patty Kuo Tel 011-886-2-2659-6368 Fax 886-2-2659-4982
Avant Technology	http://www.avanttechnology.com	Brad Scoggins Phone: (512)491-7411 Fax: (512)491-7412 brads@avanttechnology.com
Aved Memory Products	http://www.avedmemory.com/	
Buffalo Technology	http://www.buffalotech.com/	(800) 967-0959 memory@buffalotech.com
Centon Electronics	http://www.centon.com	Tel: 949-855-9111 Fax: 949-855-6035
Corsair	http://www.corsairmicro.com/	Tel: 510-657-8747 Fax: 510-657-8748
Dane-Elec	http://www.dane-memory.com/	Michal Hassan @ (949)450-2941 or email @ Michal@Dane-memory.com
Dataram	http://www.dataram.com/	Paul Henke, 800-328-2726 x2239 in USA 609-799-0071 phenke@dataram.com
GoldenRAM	http://www.goldenram.com	Jason M. Barrette @ 800-222-861 x7546 jasonb@goldenram.com or Michael E. Meyer @800-222-8861 x7512 michaelm@goldenram.com
Hitachi	http://semiconductor.hitachi.com/pointer/	
Hynix Semiconductor	http://www.hynix.com/	
Qimonda (Infineon)	http://Qimonda.com	
ITAUCOM	http://www.itauc.com.br	
JITCO CO LTD	http://www.jitco.net/	Seong Jeon Tel: 82-32-817-9740 s.jeon@jitco.net
Kingston	http://www.kingston.com	US.- Call (877) 435-8726 Asia – Call 886-3-564-1539 Europe – Call +44-1932-755205
Legacy Electronics Inc.	http://www.legacyelectronics.com	U.S. Contact: Gary Ridenour, 949-498-9600, Ext 350 European Contact: 49 89 370 664 11
Legend	http://www.legend.com.au	
Micron	http://www.micron.com/	
MSC Vertriebs GmbH	http://www.msc-ge.com	William Perrigo 49-7249-910-417 Fax: 49-7249-910-229 wpe@msc-ge.com
Nanya Technology	http://www.ntc.com.tw	Winson Shao 886-3-328-1688, Ext 6018 winsonshao@ntc.com.tw

Vendor Name	Web URL	Vendor Direct Sales Info
Netlist, Inc	http://www.netlistinc.com	Christopher Lopes 949.435.0025 tel 949.435.0031 fax sales@netlistinc.com
Peripheral Enhancements	http://www.peripheral.com/	
Samsung	http://www.samsung.com/Products/Semiconductor/	For US customers go to:
Silicon Tech	http://www.silicontech.com/contact/salescontacts.shtml	
Simple Tech	http://www.simpletech.com	Ron Darwish @ (949) 260-8230 or email @ Rdarwish@Simpletech.com
SMART Modular Technologies	http://www.smartm.com/channel	Gene Patino (949) 439-6167 Gene.Patino@Smartm.com
Super Talent Electronics	http://www.supertalentmemory.com	David Crume (408) 957-8181 support@supertalentmemory.com
Swissbit	http://www.swissbit.com	Tony Cerreta Tel: 914-935-1400 x240 Fax: 914-935-9865 tony.cerreta@swissbitna.com
TechnoLinc Corporation	http://www.technolinc.com	David Curtis 510-445-7400 davidc@technolinc.com
TRS* Tele-Radio-Space GmbH	http://www.certified-memory.com http://www.certified-memory.de	Vender Direct Sales Info: Andreas Gruendl Tel: +49.89.945532-34 Fax: +49.89.945532-41 Andreas.gruendl@trs-eu.com
Unigen	http://www.unigen.com	
Ventura Technology Inc	http://www.venturatech.com	Sam Lewis 760 599-0080 ext. 1
Viking InterWorks	http://www.vikinginterworks.com	
Virtium Technology Inc	http://www.virtium.com	Tod Skelton @ (949) 460-0020 ext. 146 or email @ tod.skelton@virtium.com
Legend	http://www.legend.com.au	Tel: 800-338-2361 Fax: 949-459-8577 orderdesk@vikingcomponents.com
Wintec Industries	http://www.wintecindustries.com	Tel 510-360-6300 Fax 510-770-9338

6. CMTL* (Computer Memory Test Labs)

CMTL is a privately owned and operated memory testing organization responsible for testing a broad range of memory products. Memory devices tested by CMTL must undergo a rigorous battery of tests to ensure that the product will perform the intended server functions. Memory capability is a major factor your customers consider. CMTL has the ability to test and certify memory on Intel-based server platforms. The list of memory modules, which have undergone testing through the CMTL facility, should be referenced when considering modules for integration into this Intel server product. Stringent standards with regard to manufacturing procedures and quality must be met to pass the exacting tests required for qualification through the independent testing facility. Testing is performed by CMTL with Intel server products and test procedures defined by Intel's Memory Qualification Lab. Intel routinely audits the CMTL facility to ensure all procedures, process handling, and testing methodologies are met.

IMPORTANT NOTE

DIMM devices with gold contacts should NOT be placed into DIMM sockets with tin-lead contacts or vice-versa. Mixing dissimilar metal contact types has been shown to result in unreliable memory operation. Intel recommends similar manufacturer and similar speeds in each Rank on the memory module. Mixing of dissimilar memory manufacturer devices or dissimilar memory device speeds is not recommended. This document contains information which is the proprietary property of Intel Corporation. Nothing in this document constitutes a guaranty, warranty, or license, express or implied. Intel has tested the following DIMMs for minimum electrical and functional compatibility with the Intel® Server RAID Controller. This listing is not intended to be all inclusive; it only represents the DIMMs Intel or CMTL has tested. Users of this list are reminded to check with the DIMM manufacturer or Distributor to ensure that a particular DIMM model is adequate for the intended purpose on the Intel® Server RAID Controller. Intel provides no indemnities for and expressly disclaims all liabilities for any and all such guaranties, representations, and warranties (oral or written) whether express or implied, related to DIMMs in a Intel® Server RAID Controller product, including without limitation to: fitness for a particular purpose; merchantability; noninfringement of intellectual property or other rights of any third party or of Intel. The reader is advised that third parties may have intellectual property rights which may be relevant to this document and the technologies discussed herein, and is advised to seek the advice of competent legal counsel, without obligation of Intel. Intel retains the right to make changes to this document at any time, without notice. Intel makes no warranty or representation with respect to the use of this document or reliance by the reader upon its contents, and assumes no responsibility for any errors which may appear in the document nor does it make a commitment to update the information contained herein.

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